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(54) Cork extractor

(57) A cork extractor comprises an extraction carrier 9 carrying a control nut 6 containing a hole and movable axially but not rotationally, and an insertion carrier 10 with a helical worm 12 mounted thereon and movable axially with respect to the extraction carrier, the worm passing through the hole in the nut. To pierce the cork 4 with the worm the insertion carrier, which may be actuated by depressing levers 13, is caused to move axially downwardly relative to the extractor carrier, the worm rotating due to passing through the hole in the stationary nut. For a long cork the levers may be depressed their full extent (figure 2), but for a shorter cork the levers are only partially depressed to prevent the worm from piercing the cork bottom. To extract the cork the extraction carrier 9 is moved axially upwardly taking the insertion carrier and worm with it (figure 3), preferably by depressing a second set of levers 19, the worm being prevented from rotating as the control nut is withdrawn due to the torque applied to the worm by the nut being equal and opposite to the torque applied to the worm by the cork. Preferably the worm is coated with a friction reducing material, as also is the nut. To remove the extracted cork from the worm the levers 13 are grasped together and the extraction levers 19 pulled back up to their initial position causing the carrier 9 to move axially back down to its initial position as shown in figure 1, the nut causing the worm to rotate and the cork to unwind from the worm. The levers may be orthogonally mounted, cross mounted (figure 4), or parallel (figure 5), with rack and pinion arrangements between the levers and the carriers. A gauge may be provided (27,figure 5) to provide visual indication of the worm in the cork. The worm may alternatively be rigidly fixed to a handle (10, figure 13), the user applying both a downward pressure and clockwise torque to the handle to move the worm through the control nut.

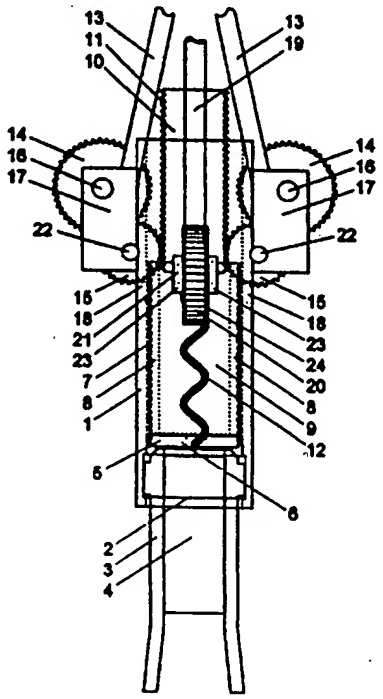

FIG. 1

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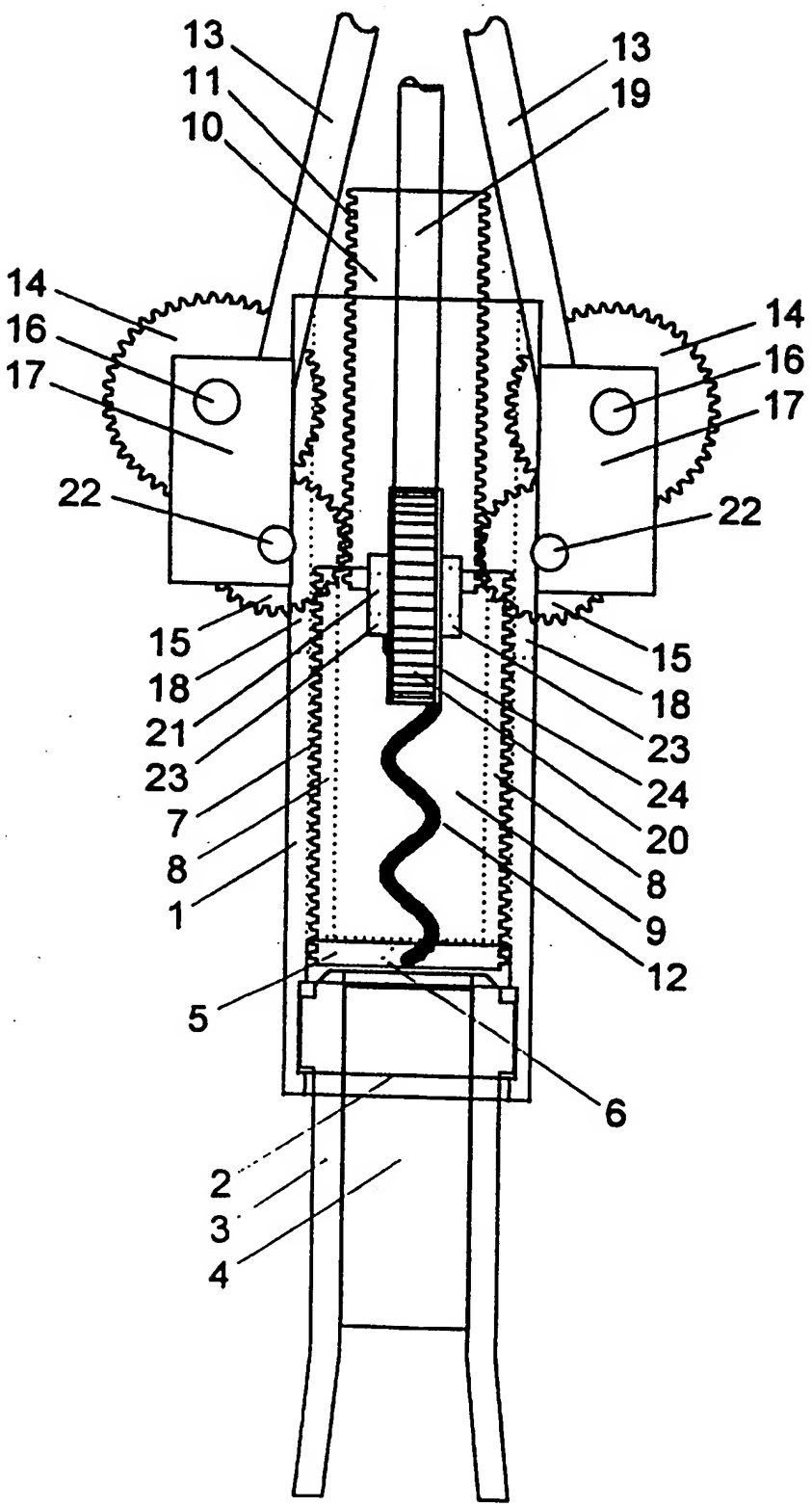
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FIG. 1

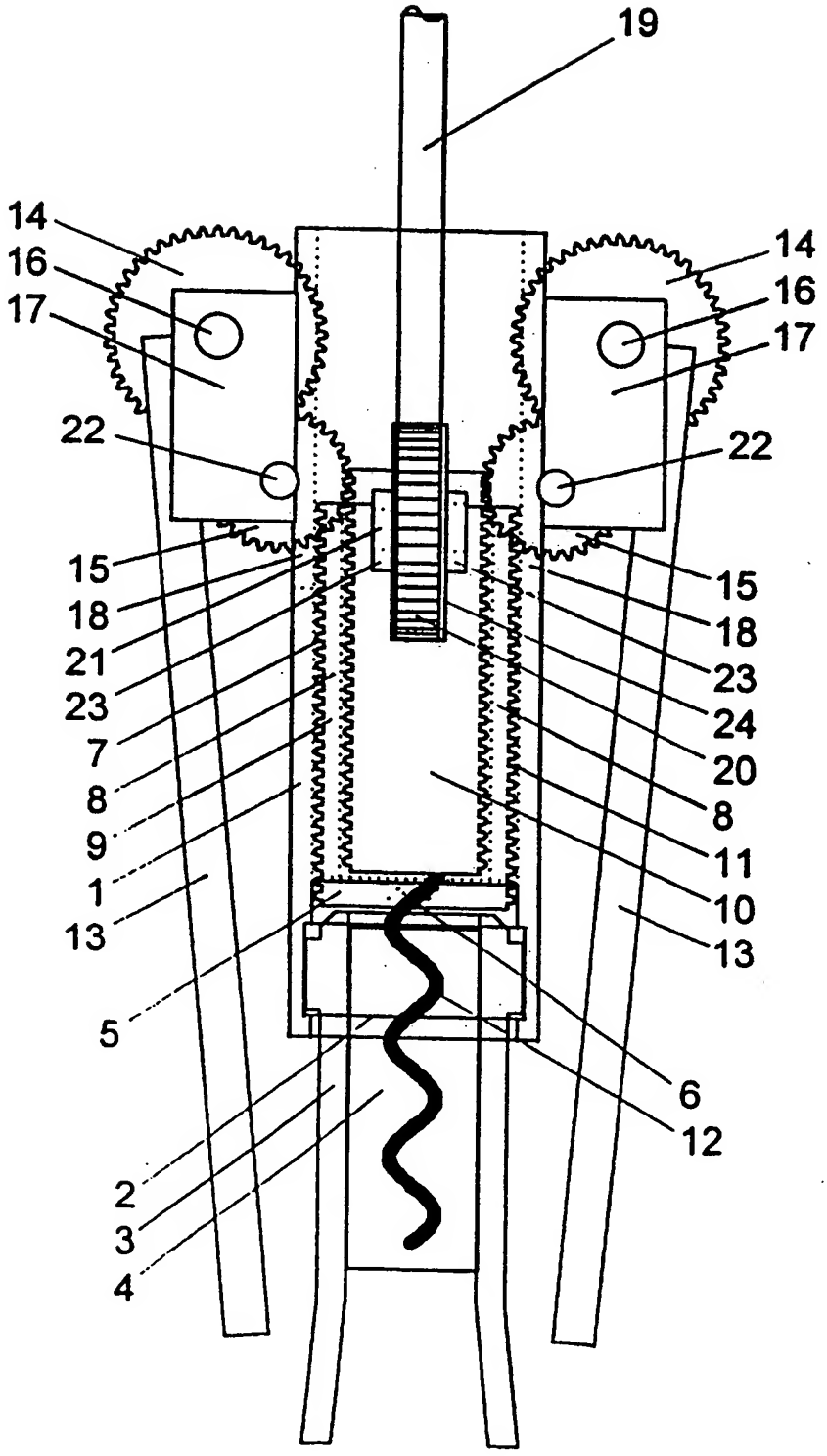
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FIG. 2

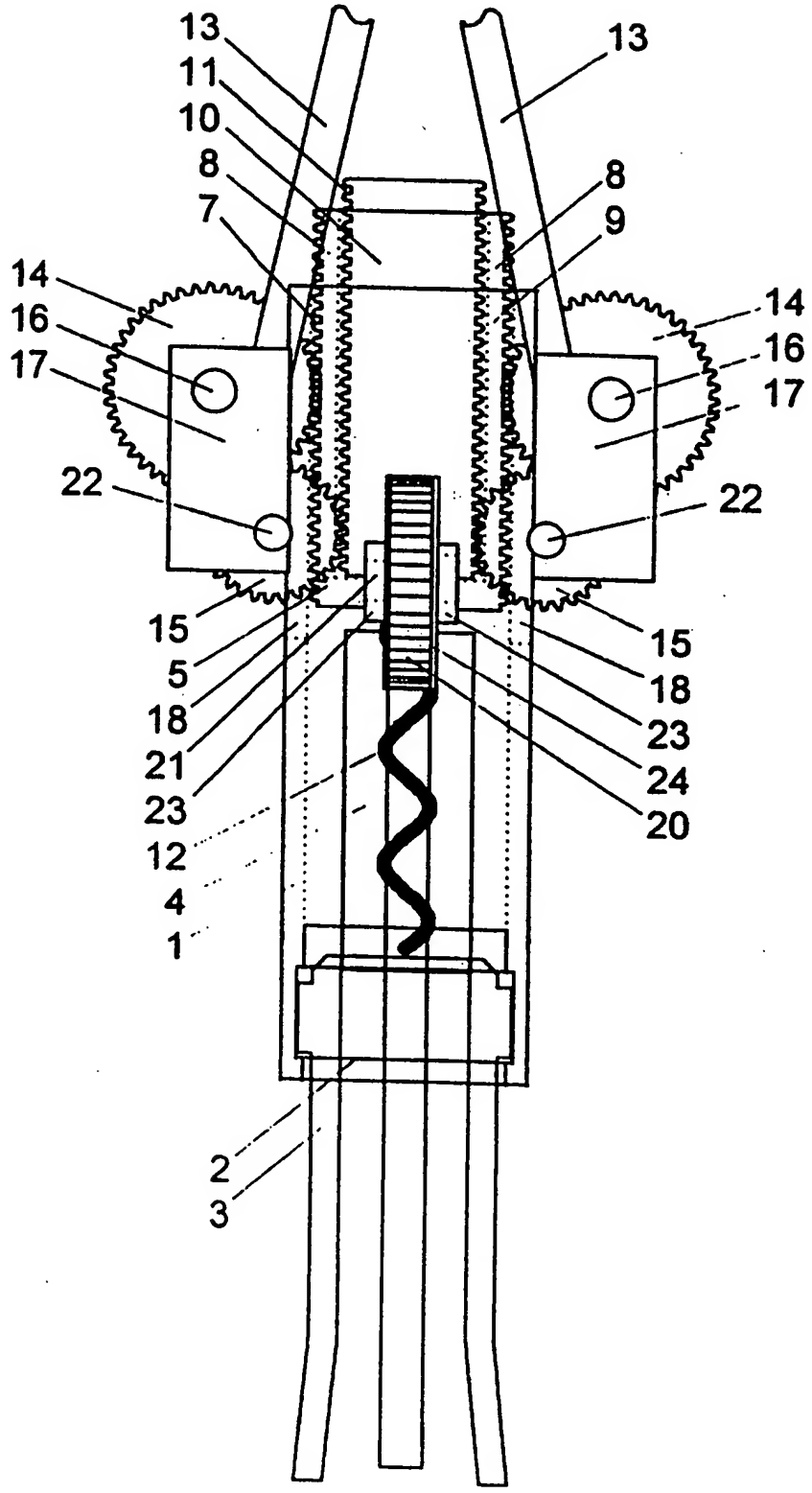
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FIG. 3

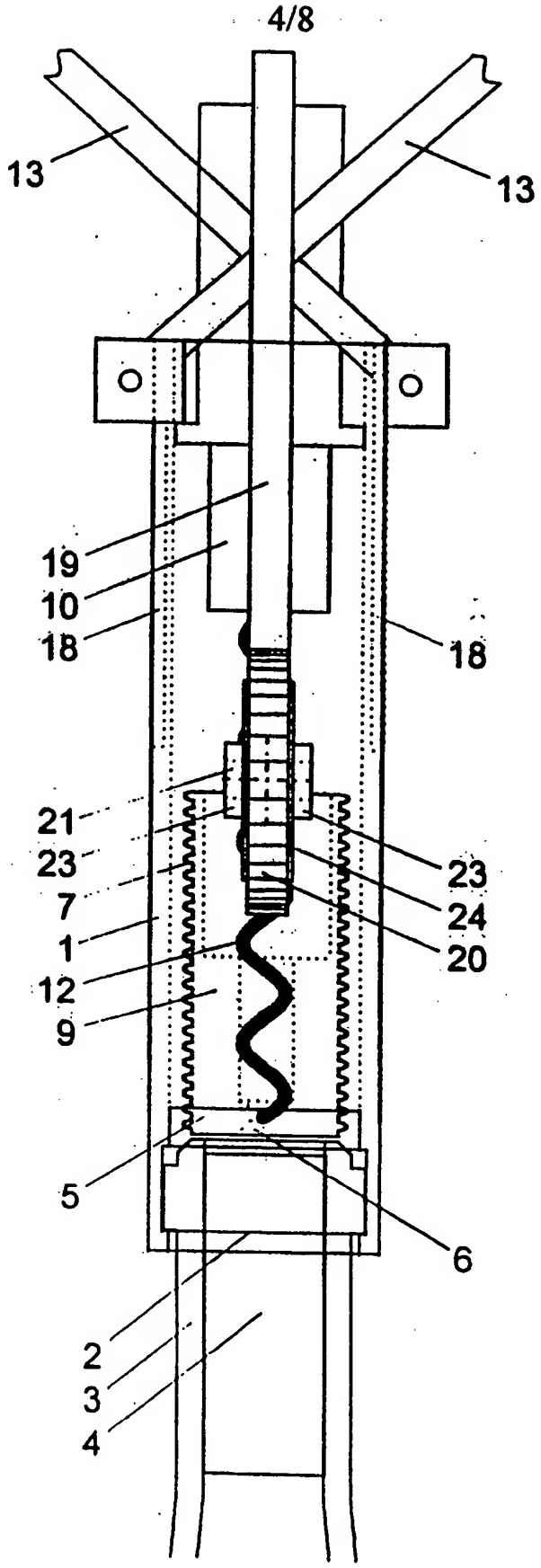

FIG. 4

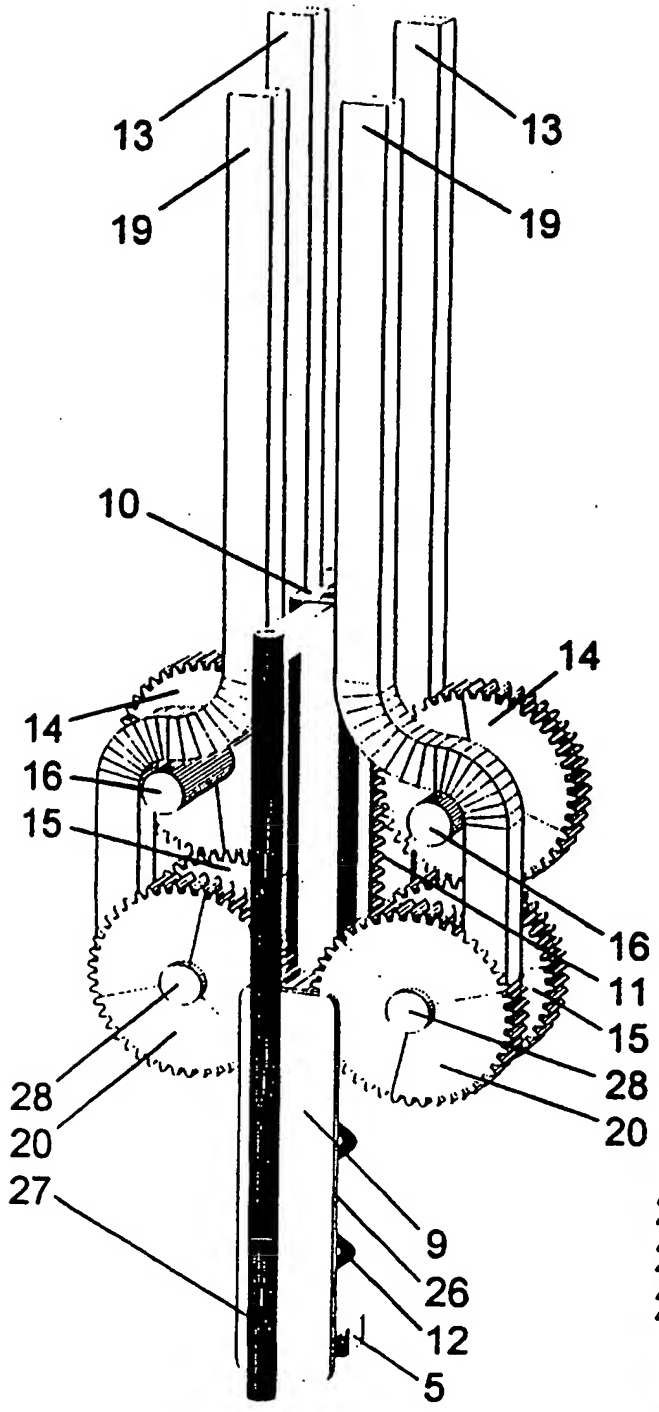
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FIG. 5

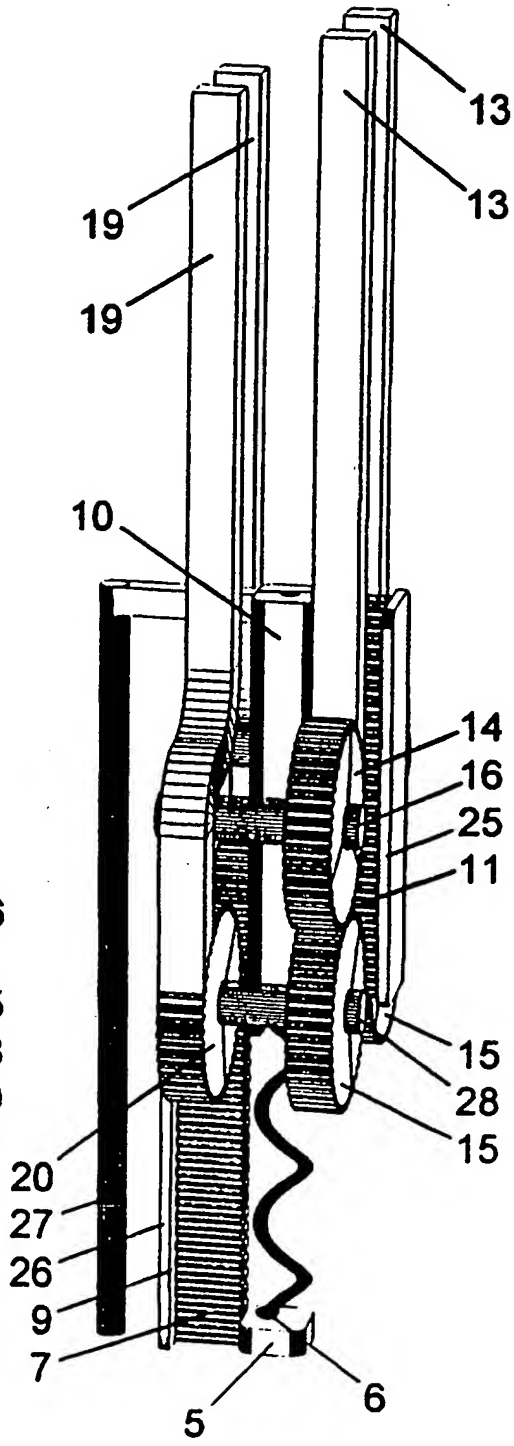
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FIG. 6

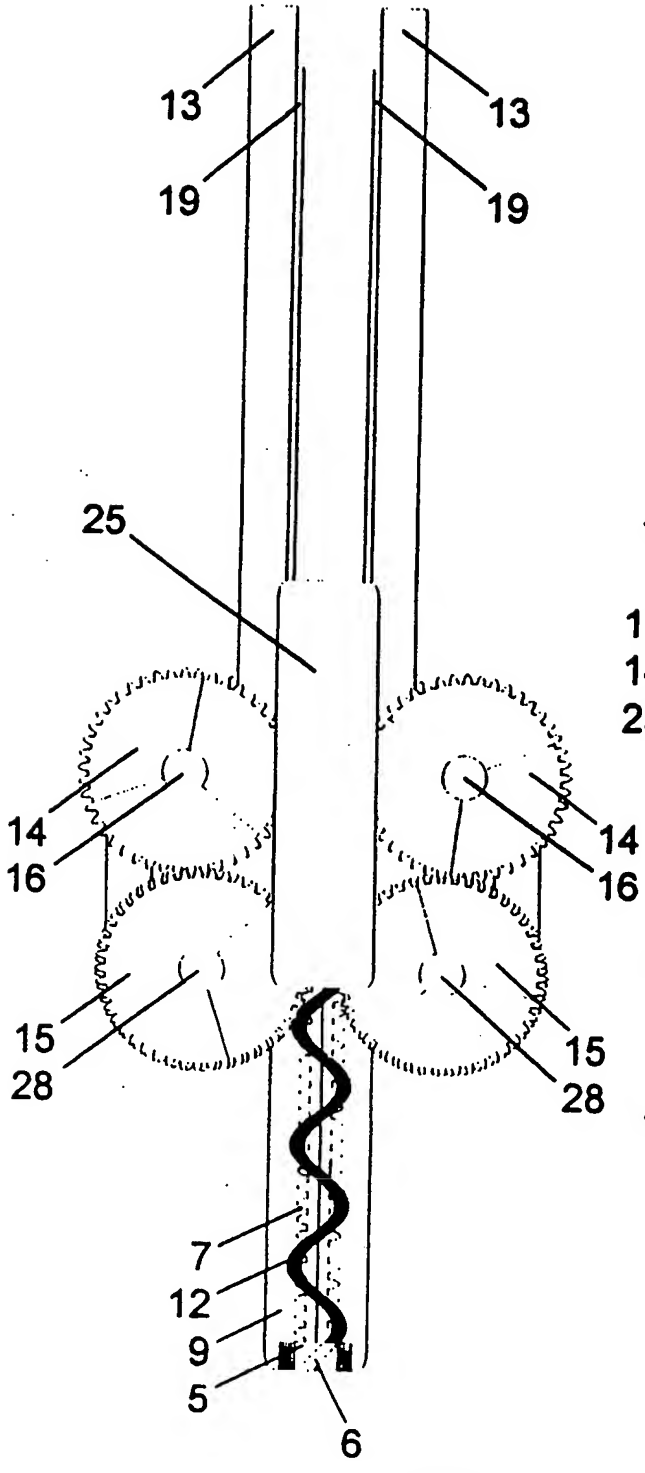
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FIG. 7

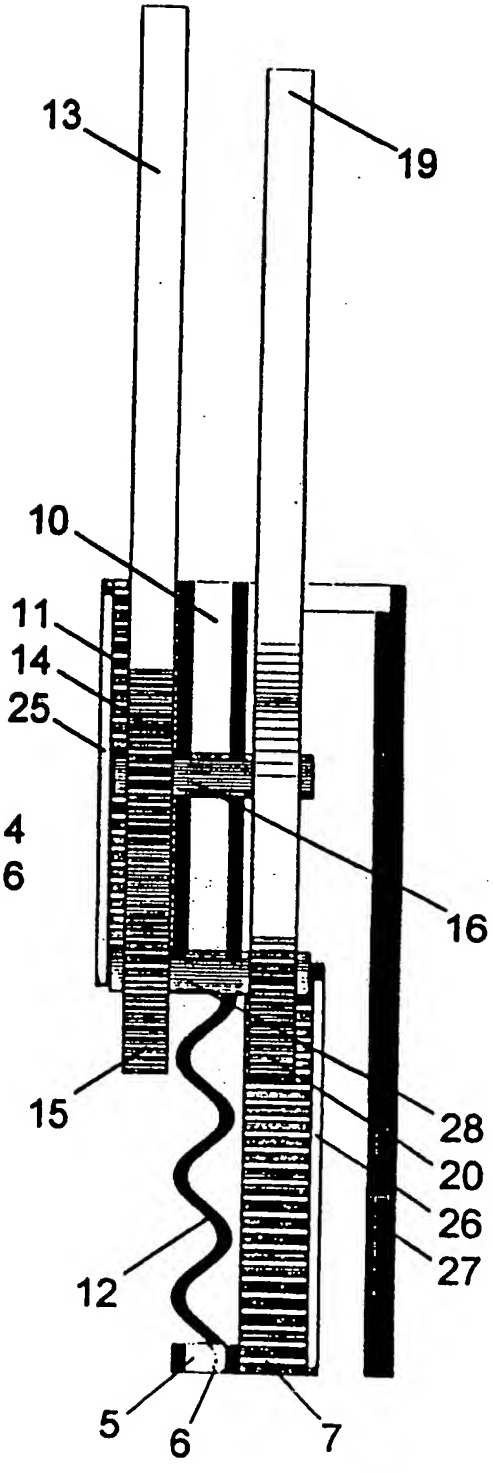
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FIG. 8

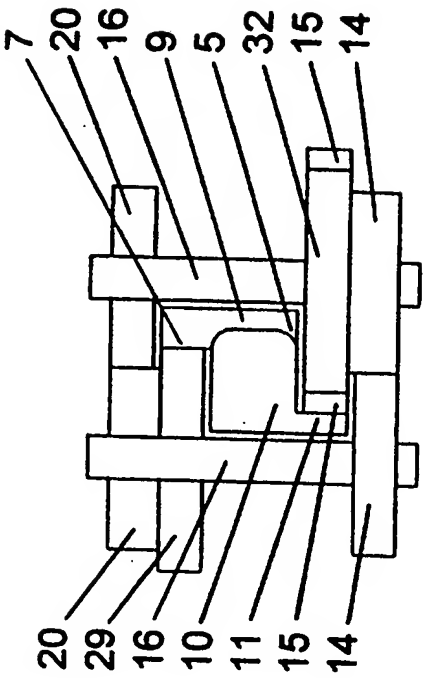

FIG. 11

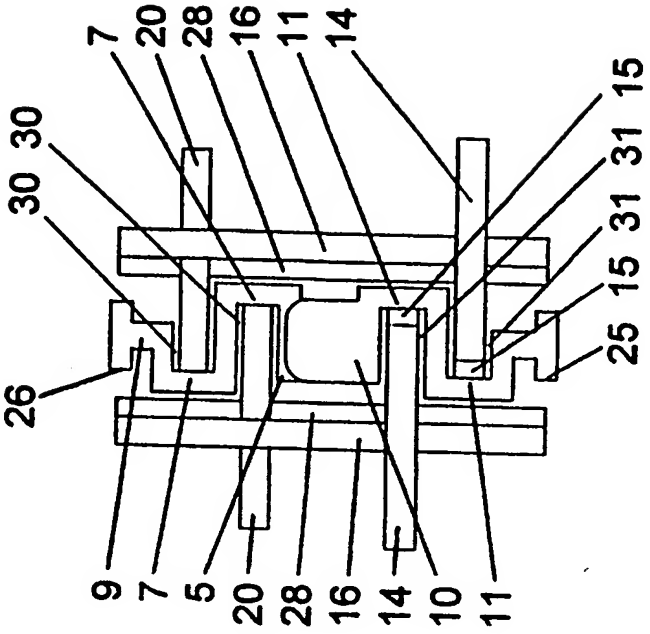

FIG. 12

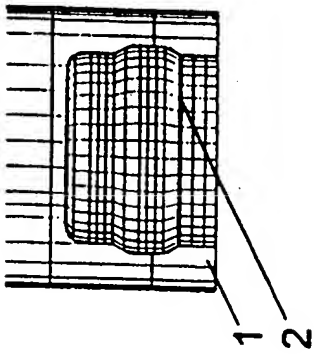

FIG. 9

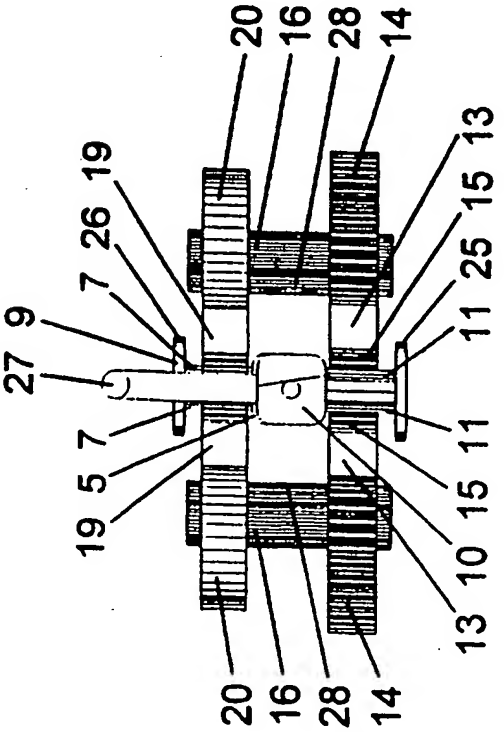

FIG. 10

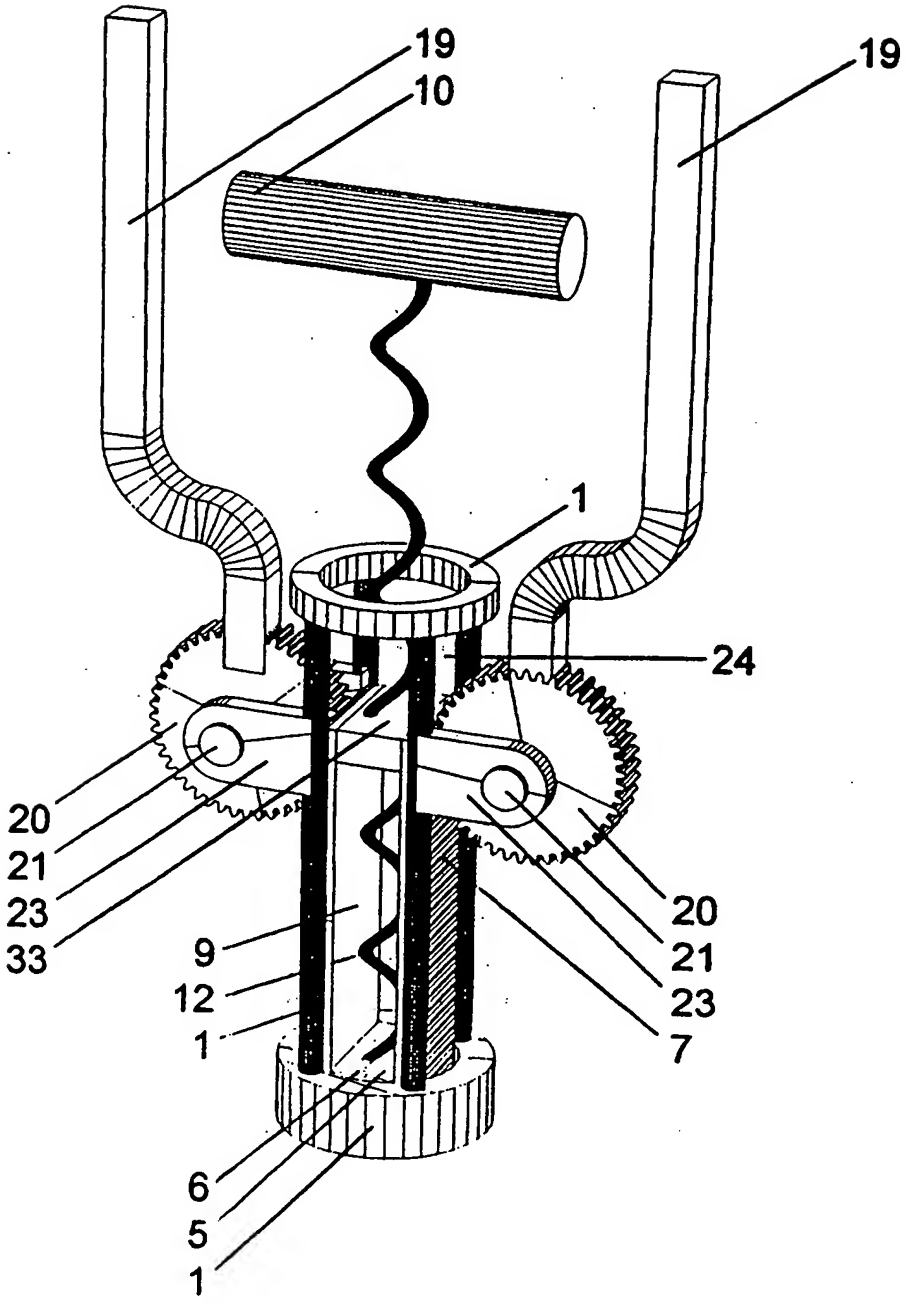

FIG. 13

Cork Extractor

This invention relates to a cork extractor or corkscrew.

Corkscrews are already known in prior art. The most usual modus operandi is a three-stage process as follows:

1. Insertion: Part of the corkscrew (a worm) is rotated as it is inserted and engages with the cork.

2. Extraction: The worm is drawn away from the bottle, bringing with it the cork.

3. Cork removal: The cork is removed from the corkscrew.

I shall term corkscrews employing this three stage process conventional corkscrews; the present invention is a conventional corkscrew.

Most of the prior art provides for new means of extraction but requires that the worm is rotated manually relative to the cork on insertion and requires that cork removal is also achieved manually by rotating the cork in order to wind it down the worm.

There also exists a body of prior art within conventional corkscrews in which the insertion and cork removal processes are effected by means which convert a linear force into a rotational force by driving the worm through a nut. I shall term these inventions nut corkscrews; the present invention is a nut corkscrew which improves on existing nut corkscrews.

Examples of nut corkscrews are provided by US patents No. 532,575 and No. 678,773 and by UK patent No. 2,127,795. These corkscrews are quick and easy to use but suffer from several problems which only come to light when these devices are tested on a wide range of bottles and corks. These problems include: mechanical complexity; inherent unreliability as a result of excess mechanical complexity; inability to extract shorter corks without piercing the bottom of the cork; ungainly operation due to inherently unbalanced forces. In particular whilst UK patent No. 2,127,795 addresses several of the problems encountered with earlier nut corkscrews there remains an inherent risk of unwinding the worm from the cork rather than extracting the cork from the bottle. I shall term this problem the backing out problem.

Among the numerous design objectives for a conventional corkscrew should be included:

- ease of use
- speed of use
- intuitiveness

- means of ensuring that the worm is inserted co-axially with the cork
- means for ensuring that the cork is extracted in a straight line along its own axis
- means for reducing the forces required throughout the process, and for balancing the remaining forces or directing them along the axis of the bottle
- ability to extract corks of varying lengths without causing any part of the cork to remain inside the bottle or to break off and drop into the wine (for conventional corkscrews this implies the ability to control the depth to which the worm is inserted in the cork)
- economy of manufacture
- reliability and durability
- attractiveness of appearance

The prior art does not provide a nut corkscrew in which all the major forces are either balanced or directed along the axis of the bottle, nor one wherein the worm may be inserted to different depths according to the length of cork.

As used herein, terms such as up and down, upper and lower, upward and downward, above and below will be construed with respect to the apparatus as it would appear when positioned for use on a bottle standing upright. The terms axial and longitudinal both refer to the vertical direction, parallel with the longitudinal axis of the bottle, cork and worm. Such terms are used for convenience and should not be construed in a limiting sense.

According to the present invention there is provided apparatus for extracting a cork from a bottle comprising:
first actuator means comprising a worm, said worm having an axis extending along its length, wherein said first actuator means is movable in the axial direction of said worm with respect to said bottle and is rotatable about the axis of said worm relative to said bottle;
second actuator means movable with respect to said first actuator means in the axial direction of said worm, said second actuator means being arranged whereby such relative movement causes rotation of said worm about its axis, wherein said second actuator means is movable in the axial direction of said worm with respect to said bottle but is substantially prevented from rotating about the axis of said worm relative to said bottle.

Some embodiments of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows the orthogonal embodiment in its initial position, prior to insertion of the worm into the cork.

Figure 2 shows the orthogonal embodiment after insertion of the worm and prior to extraction of the cork.

Figure 3 shows the orthogonal embodiment after extraction of the cork and prior to cork removal from the worm.

Figure 4 shows the crossed lever embodiment in its initial position, prior to insertion of the worm into the cork.

Figure 5 shows a perspective view of the parallel embodiment with the body omitted for clarity, in its initial position, prior to insertion of the worm into the cork.

Figure 6 shows another perspective view of the parallel embodiment with the body omitted for clarity, in its initial position, prior to insertion of the worm into the cork.

Figure 7 shows the rear view of the parallel embodiment with the body omitted for clarity, in its initial position, prior to insertion of the worm into the cork.

Figure 8 shows the side view of the parallel embodiment with the body omitted for clarity, in its initial position, prior to insertion of the worm into the cork.

Figure 9 shows the front view of the shaped cavity that could be used to engage the body of the cork extractor with the neck of the bottle.

Figure 10 shows the top view of the parallel embodiment with the body omitted for clarity, in its initial position, prior to insertion of the worm into the cork.

Figure 11 shows a diagrammatic representation of the layout of the top view of the first reduced width embodiment, with the body, the guide means and the insertion and extraction levers omitted for clarity.

Figure 12 shows a diagrammatic representation of the layout of the top view of the second reduced width embodiment, with the body and the insertion and extraction levers omitted for clarity.

Figure 13 shows a perspective view of the rotary insertion embodiment in its initial position, prior to insertion of the worm into the cork.

An embodiment of the present invention, known as the orthogonal embodiment, will now be described by reference to figures 1 to 3.

Referring first to Figure 1 there is shown a hollow cylindrical body 1 engaged by means of a lip 2 with a bottle 3 stoppered by a cork 4.

Inside the body 1 and parallel and concentric with it there is a hollow cylindrical extraction carrier 9 which is free to slide longitudinally with respect to the body 1. The outer cylindrical surface of the extraction carrier 9 is wholly covered with a plurality of equally spaced circular grooves which together constitute an extraction rack 7. At the lower end of the extraction carrier 9 there is a base plate 5 containing a hole 6 (hidden). The base plate 5 and hole 6 together constitute a control nut. The extraction carrier 9 is prevented from rotating by means of a grub screw (not shown) held in the body 1 and constrained by a longitudinal groove (not shown) in the extraction rack 7. There are two opposite slots 8 (hidden) through the extraction rack 7 which are deep enough to pass completely through it into the hollow centre of the extraction carrier 9 and which run the full length of the extraction carrier 9.

Inside the extraction carrier 9 and parallel and concentric with it there is a cylindrical insertion carrier 10 which is free to slide longitudinally with respect to the extraction carrier 9 and which is free to slide longitudinally with respect to the body 1. The outer cylindrical surface of the insertion carrier 10 is wholly covered with a plurality of equally spaced circular grooves which together constitute an insertion rack 11.

A helical worm 12 is rotatably mounted on the insertion carrier 10 for joint longitudinal movement therewith, the axis of rotation of the worm 12 being generally coincident with its own axis. The worm 12 is maintained in this alignment at its upper end by the insertion carrier 10 and at its lower end by the hole 6 in the control nut.

The hole 6 in the base plate 5 is displaced from the axis of the worm 12 by a distance equal to the helical radius of the worm 12 and is of such a shape and at such an angle as to allow the worm 12 to pass through it provided that the worm 12 rotates at the rate determined by the pitch of its helix.

The insertion carrier 10 is actuated by insertion means comprising an opposing pair of insertion levers 13 mounted on an opposing pair of insertion pinions 14 acting through an opposing pair of direction reverser pinions 15 onto opposite sides of the insertion rack 11. The direction reverser pinions 15 mate with the insertion rack 11 by acting through the slots 8 in the extraction carrier 9. The insertion pinions 14 and direction reverser pinions 15 are mounted on axles 16 and 22 respectively held between opposite pairs of insertion plates 17 mounted on opposite sides of the body 1. The body 1 has slots 18 (hidden) to enable the insertion pinions 14 and direction reverser pinions 15 to pass through and engage with the insertion rack 11.

The extraction carrier 9 is actuated by extraction means comprising an opposing pair of extraction levers 19 mounted on an opposing pair of extraction pinions 20 acting on opposite sides of the extraction rack 7. The extraction levers 19 and extraction pinions 20 are positioned orthogonally relative to the insertion levers 13, the insertion pinions 14 and the direction reverser pinions 15. The extraction pinions 20 are mounted on axles 21 (hidden) held between opposite pairs of extraction plates 23 mounted on opposite sides of the body 1. The body 1 has slots 24 to enable the extraction pinions 20 to pass through and engage with the extraction rack 7.

The operation of the orthogonal embodiment will now be described with reference to figures 1 to 3.

The bottle 3 is placed on a table and the body 1 of the corkscrew is moved sideways across the top of the bottle 3 in such a way as to engage the lip 2 of the body 1 beneath the similar shaped feature on the neck of the bottle 3. There is a reasonably tight fit between the body 1 of the corkscrew and the bottle 3 which may be improved if the body 1 is manufactured from a plastic or similar material with sufficient compliance and elasticity to provide a gripping force between the body 1 of the corkscrew and the bottle 3.

With the corkscrew secured to the bottle 3 as shown in figure 1, the two insertion levers 13 are depressed, causing the insertion pinions 14 and direction reverser pinions 15 to rotate and the insertion carrier 10 and worm 12 to move longitudinally down inside the extraction carrier 9. The hole 6 in the plate 5 causes the longitudinally moving worm 12 to assume in addition a rotational movement so that the worm 12 rotates at a rate determined by the pitch of its helix and it enters the cork 4 as shown in figure 2.

The amount of force that must be applied to the insertion levers 13 may be significantly reduced if the worm 12 is coated with a friction reducing material such as polytetrafluoroethylene or another suitable plastic. The frictional force may be further reduced if the plate 5 is made from a low-friction plastic or the hole 6 in the plate 5 is coated or lined with a friction reducing material.

For a long cork the insertion levers 13 will be depressed to their full extent, but for a shorter cork it is preferable to depress them only partially in order to prevent the worm 12 piercing the bottom of the cork 4.

With the worm 12 engaged in the cork 4, the extraction levers 19 are depressed, causing the extraction pinions 20 to rotate and the extraction carrier 9 to move longitudinally up inside the body 1. The worm 12 is prevented from rotating as the control nut is withdrawn because the torque applied to the worm 12 by the control nut is equal in magnitude and opposite in direction to the torque applied to the worm 12 by the cork 4. The worm 12 is therefore pushed upwards without rotating by the control nut and the cork 4 is extracted from the bottle 3. The worm 12 in turn pushes up the insertion carrier 10 which causes the direction reverser pinions 15 and insertion pinions 14 to rotate and the insertion levers 13 to rise back to their initial positions as shown in figure 3.

With the cork 4 thus extracted, the corkscrew is disengaged from the bottle 3 by sliding it sideways to release the neck of the bottle 3 from the lip 2. The insertion levers 13 are grasped together by the user with one hand and the other hand is used to pull either one of the extraction levers 19 back up to its initial position. This causes the extraction pinions 20 to rotate and the extraction carrier 9 to move longitudinally back down to its initial position as shown in figure 1. As the extraction carrier 9 moves downwards the control nut causes the

worm 12 to rotate, unwinding the cork 4 from the worm 12. The cork 4 drops away from the corkscrew which is now restored to its initial position.

The force required for this last (cork removal) process may be reduced if the worm 12 is coated with a friction reducing material such as polytetrafluoroethylene or another suitable plastic.

Although the mechanical effort required in the cork removal process is not great, this may be further reduced by inserting a weak compressive spring between the top of insertion carrier 10 and the bottom of extraction carrier 9. This would become compressed during the insertion process, would remain compressed during the extraction process and would extend to assist the cork removal process. It would have the additional benefit of ensuring that the corkscrew would naturally assume its initial position, thereby making it more intuitive for the novice user.

The way in which the orthogonal embodiment of the present invention solves the problems encountered with previous nut corkscrews is through the provision of the two independently operable pairs of levers. The fact that the user has, via the extraction levers, the ability directly to apply a longitudinal force to the control nut obviates the need for the various latching systems and other means of controlling whether the control nut is fixed relative to the body or moves jointly with the insertion carrier.

In the prior art the control nut is either controlled by various latching means (US patent No. 678,773) or relies on a combination of latching means and a variety of frictional forces (US patent No. 532,575 and UK patent No. 2,127,795). As a result the prior art either requires the insertion carrier to be moved to (or almost to) the limit of its freedom of movement in order for a latching means to be actuated or suffers from at least some risk of experiencing the backing out problem as a result of relying to some extent on frictional forces to prevent rotation of the worm relative to the control nut during extraction.

The provision in the orthogonal embodiment of the extraction levers thus enables the entire process to be performed without any latching means and without relying on any frictional forces. This therefore reduces the mechanical complexity of the device, improving its economy of manufacture and improving its inherent reliability. The use in the orthogonal embodiment of the extraction levers is also what enables the present invention to avoid piercing shorter corks, as the extraction process can be commenced before the insertion carrier has descended to the lower limit of its freedom of axial movement relative to the body. The present invention does not rely on friction between the worm and the cork, as in the absence of friction on the worm the axial tension and torque on the worm from the cork will be equal and opposite to the axial tension and torque on the worm from the control nut. The application of a coating of a friction reducing material such as polytetrafluoroethylene or another suitable plastic will not cause a backing out problem (although it may lead to the cork rotating slightly in the bottle as it is extracted), as the design of the present invention ensures that the present invention is not susceptible to backing out.

The ungainly operation of the prior art devices on account of their inherently unbalanced forces is also avoided in the orthogonal embodiment of the present invention by the provision of the two independently operable pairs of levers. It is by having two sets of independently operable levers that the operation of the present invention is substantially limited to two downward strokes, thereby ensuring that the only major force from the apparatus on the bottle is an axial compression, counteracted by an increased reaction from the table on which the bottle is standing.

Throughout the worm insertion and cork extraction processes, the main forces applied to the levers are either balanced by each other or directed substantially along the longitudinal axis of the bottle. Depressing the insertion levers gives rise to a tensile force between the body and the bottle and the main purpose of the lip 2 is to provide means of transmitting this tensile force.

Although the drawings accompanying this description all show apparatus with right-handed helical worms, the worm may be left or right handed provided that the control nut is configured to suit, and the worm may be a substantially helical or Archimedian worm. One of the advantages of several embodiments of the present invention is that they are as easy to use for the left-handed as for the right-handed user. The helical worm is generally preferred because it tends to cause less damage to the cork.

It should be noted that the above description only describes one embodiment of the present invention. There shall now follow a brief description of some other embodiments of the present invention.

In the non-orthogonal embodiment the invention is as described in the orthogonal embodiment except that the insertion levers 13 and the extraction levers 19 are arranged at an angle to each other which is not orthogonal.

The crossed-lever embodiment of the present invention shown in figure 4 is similar to the orthogonal embodiment except that the insertion means is by direct pressure from the insertion levers 13 onto a bearing surface (not shown) in the insertion carrier 10. The insertion levers 13 are mounted on the body 1 so that they pass across the insertion carrier 10, eliminating the need for the insertion pinions 14 and direction reverser pinions 15. This embodiment is otherwise similar to the orthogonal embodiment.

The working parts of the parallel embodiment are illustrated in figures 5 to 10. In the parallel embodiment the insertion levers 13 and the extraction levers 19 operate in substantially parallel planes, which makes the corkscrew neater in appearance and narrower in width than the orthogonal embodiment. In the parallel embodiment the insertion carrier 10 incorporates insertion guide means 25 and the extraction carrier 9 incorporates extraction guide means 26 to allow longitudinal movement but prevent rotational movement of the insertion carrier 10 and the extraction carrier 9 relative to the body 1. In the version shown of the parallel embodiment the axles 22 and 21 are combined into axles 28 to facilitate manufacture.

An additional feature shown on the parallel embodiment is an external gauge 27 mounted on the insertion carrier 10 which moves in parallel with the worm 12 down the outside of the bottle 3 to provide a visual indication of the depth of the worm 12 in the cork 4, enabling the worm 12 to be inserted to the optimal (maximum) depth but without piercing the bottom of the cork 4. The external gauge 27 could be incorporated in any other embodiment of the present invention.

An alternative to the external gauge 27 would be to provide a user-detectable point of increased resistance at a certain stage in the insertion process, namely at the point where the bottom of the worm 12 is just above the bottom of a normal length cork. This would provide the user with the option of extracting from that point, thereby preventing the bottom of a standard cork being pierced, or of continuing with the insertion process to be confident of getting the maximum depth of penetration for a very long cork.

The corkscrew will offer a more pleasing appearance if it can be reduced in size. However the embodiments so far described do not allow the width of the corkscrew to be less than the sum of twice the diameter of the extraction pinion and the width of the extraction rack. This is shown in figure 10. Furthermore there is a direct relationship between the size of the extraction pinions and the amount of longitudinal movement of the extraction carrier. As corks may be over 50mm in length and each embodiment of the present invention has a limit to the angle through which the levers may conveniently be operated this typically imposes a minimum diameter for the extraction pinions of about 25-35mm. I shall term this diameter the limiting diameter. A similar constraint applies to the minimum width for the insertion mechanism, except that the width of the insertion mechanism is greater than the width of the extraction mechanism because the insertion pinions must be mounted further apart than the direction reverser pinions so that they do not mate with the insertion rack. However some further developments of the parallel embodiment provide means for reducing the overall width of the corkscrew to less than the limit imposed by the parallel embodiment.

The top view of the first reduced width embodiment is shown in figure 11. The first reduced width embodiment allows the two extraction pinions 20 to mate with each other and to be of a smaller diameter than the limiting diameter by mounting one of the extraction pinions 20 on an intermediate extraction pinion 29 which is of the limiting diameter. The larger diameter of the intermediate pinion 29 enables the full longitudinal range of the extraction rack 7 to be maintained but the reduced diameter of the extraction pinions 20 allows the overall width of the corkscrew to be reduced to less than twice the limiting diameter. A similar arrangement reduces the width of the insertion means by allowing the two insertion pinions 14 to mate with each other and mounting one of the insertion pinions 14 on an intermediate insertion pinion 32, which itself then mates with a single direction reverser pinion 15. For the purpose of clarity, figure 11 does not show the body, guide means and insertion and extraction levers.

The second reduced width embodiment is shown in figure 12 which shows how the parallel embodiment may be reduced in width by overlapping the extraction pinions 20 and mounting the two extraction racks 7 inset into overlapping recesses 30 in the extraction carrier 9 and by overlapping the insertion pinions 14 and direction reverser pinions 15 and mounting the two insertion racks 11 inset into overlapping recesses 31 in the insertion carrier 10. Figure 12 shows an arrangement in which the overall width of the corkscrew is less than twice the limiting diameter, but this arrangement could be further compressed to a width only slightly greater than the limiting diameter. For the purpose of clarity, figure 12 does not show the body and the insertion and extraction levers.

A further embodiment (the ratchet embodiment) employs releasable ratchets on the insertion pinions and the extraction pinions. This embodiment (not illustrated) would require that each pair of levers be pushed down more than once in order to achieve the full 50mm longitudinal movements of the insertion carrier and the extraction carrier necessary to extract a full-length cork. However it would enable the corkscrew to offer the same mechanical advantage whilst using smaller pinions and shorter levers throughout. This would significantly reduce the overall height and width of the corkscrew. An additional advantage of this embodiment is that the corkscrew could be 'folded up' with all its levers all in the down position when not in use.

All the above embodiments describe devices operated by pairs of levers but the scope of the invention is not limited to embodiments wherein each set of levers comprises two levers, although such embodiments are likely to be preferred by two-handed users. In addition the scope of the invention is not limited to embodiments operated by a lever or a plurality of levers but covers any other operation means also.

In particular the rotary insertion embodiment of the present invention is shown in figure 13 and employs an extraction means substantially as described in the orthogonal embodiment but provides a simpler insertion means in which the insertion levers 13, insertion pinions 14, direction reverser pinions 15 and insertion rack 11 are omitted. In the absence of these components there is also no need for a lip 2 to locate beneath the similar shaped feature on the neck of the bottle 3. The worm 12 is mounted on the insertion carrier 10 in such a way as to prevent rotational movement therebetween and the insertion carrier 10 is enlarged in at least one direction orthogonal to the longitudinal axis of the worm 12 so that it takes the form of a handle to which the user can apply a torque about the longitudinal axis of the worm 12. The handle may be either an integral part of the insertion carrier 10 or may be separable from the insertion carrier 10. The worm 12 is then inserted by the user applying both a downward longitudinal pressure and a clockwise torque to the handle in such a way as to drive the worm 12 through the control nut into the cork 4. As shown in figure 13 the worm also passes through an upper control nut 33, which serves to improve the rigidity of the extraction carrier 9 and to provide guide means to ensure that the longitudinal axis of the worm 12 remains substantially coincident with the longitudinal axis of the body 1 of the corkscrew and hence also with the longitudinal axes of the cork 4 and the bottle 3. The rotary insertion embodiment is therefore superficially similar in operation to a conventional two-lever rack and pinion corkscrew, with the important difference that the control nut applies to the worm 12 not only a longitudinal

force but also a torque which balances the torque applied to the worm 12 by the cork 4, thereby eliminating any tendency for the worm 12 to rotate. This therefore eliminates any tendency for the worm 12 to unwind from the cork 4 on extraction (the backing out problem). In conventional two-lever rack and pinion corkscrews the worm 12 is prevented from backing out by being manufactured with a short pitched helix and by not coating the surface of the worm 12 with any friction reducing material. However the rotary insertion embodiment of the present invention allows a worm with a longer pitched helix and a friction reducing coating to be used without any risk of backing out. This means that the present invention enables a smaller number of turns of the insertion carrier 10 to achieve the same depth of insertion in the cork 4, and that as a result of the friction reducing coating the torque to be applied to the insertion carrier 10 will also be reduced. This makes the rotary insertion embodiment of the present invention quicker and easier to use than the conventional two-lever rack and pinion corkscrew. An additional advantage is that the cork 4 may be removed from the apparatus by rotating the insertion carrier 10 in the opposite direction, which will initially cause the cork 4 to jam against the bottom of the base plate 5 and, on continued rotation, will cause the worm 12 to unwind from the cork 4.

In the embodiments hereinbefore described the control nut mates directly with the worm, which may lead to wear of the friction reducing coating on the worm from the control nut. This problem can be overcome by mounting the worm on a worm carrier such that there is no relative motion between the worm and the worm carrier. In this embodiment (not illustrated) the control nut mates with a spiral or thread machined onto the worm carrier, or the control nut contains a spiral or thread and mates with spigots or similar features on the worm carrier. The spiral or thread on the worm carrier or in the control nut is in the same direction as the spiral of the worm, and of substantially the same pitch.

There is a requirement to engage the body of the corkscrew positively with the neck of the bottle and for each of the aforementioned embodiments there is a variety of different means for securing the corkscrew to the bottle, which may be drawn from prior art in the field of corkscrews or from other fields. It is important to note that the interface between the neck of the bottle and the corkscrew fulfils several functions including:

- Providing means of directing tensile force between the bottle and the body of the corkscrew during the insertion process (not required for the rotary insertion embodiment)
- Providing means of directing compressive force between the bottle and the body of the corkscrew during the extraction process
- Providing frictional resistance to the small torque transferred from the control nut to the body during both the insertion and extraction processes so as to prevent rotational movement between the body and the bottle during these processes
- Providing alignment means for ensuring that the worm is inserted and extracted substantially straight and centrally within the cork and in the direction of the cork's longitudinal axis
- Preventing any significant relative movement between the corkscrew and the bottle throughout the insertion and extraction processes that could make the attachment of the corkscrew to the bottle seem precarious to the user

In particular the shaped cavity shown in figure 9 could incorporate one or more monostable or bistable leaf springs or other springs or could be constructed of a compliant or elastic or plastic material so that a spring function could be incorporated in the material of the body itself, or could incorporate a small constriction so that when the neck of the bottle is inserted sideways beyond the narrowest point of the constriction it will clip into place and be firmly held there.

The bottle could also be gripped by means of a plurality of longitudinally extending, circumferentially spaced, radially deflectable gripping elements approximately equally resiliently biased to a normal unflexed radial position, each of which could incorporate an internal lip that could be engaged with the neck of the bottle by applying a radial force to each gripping element towards the longitudinal axis of the corkscrew. This radial force could be applied by a variety of means, including a longitudinally or rotationally adjustable collar around these elements or a circumferential sprung ring which could be tensioned by a lever action, screw action or other means and which, on being tensioned, would cause the gripping elements to be drawn towards the longitudinal axis of the corkscrew.

One or more gripping elements could also be rotatably mounted on the body of the corkscrew so that in one position the majority of the circumference of the neck of the bottle would be surrounded and gripped but the rotatably mounted gripping element or elements could be rotated about an axis parallel to the longitudinal axis of the corkscrew to another position such that an opening in the side of the body of the corkscrew would be revealed, and this opening would be of sufficient width for the neck of the bottle to pass through it. Thus the opening would initially be open so that the bottle could slide sideways into the cavity, then the rotatably mounted gripping element or elements would be rotated to close the opening and grip the bottle for the insertion and extraction processes, then the rotatably mounted gripping element or elements would be rotated back to their initial (open) position so that the corkscrew could slide off the bottle again.

It is further recognised that there exists a wider range of means of engaging the corkscrew with the bottle than that disclosed specifically within this description and that these other means may be drawn from prior art in many fields.

Claims

1. Apparatus for extracting a cork from a bottle comprising:
   first actuator means comprising a worm, said worm having an axis extending along its length, wherein said first actuator means is movable in the axial direction of said worm with respect to said bottle and is rotatable about the axis of said worm relative to said bottle;
   second actuator means movable with respect to said first actuator means in the axial direction of said worm, said second actuator means being arranged whereby such relative movement causes rotation of said worm about its axis, wherein said second actuator means is movable in the axial direction of said worm with respect to said bottle but is substantially prevented from rotating about the axis of said worm relative to said bottle.

2. Apparatus according to claim 1 wherein the existence of means for moving said second actuator means relative to said bottle in the axial direction of said worm over a substantial range of relative displacements between said first actuator means and said second actuator means whilst substantially preventing relative motion between said first actuator means and said second actuator means and whilst maintaining the position of said apparatus relative to said bottle is not contingent on there being friction between said worm and said second actuator means.

3. Apparatus according to claim 1 wherein, whether during or at the completion of the insertion of said worm into said cork, the option to stop inserting said worm and to start extracting said cork by raising said second actuator means jointly with said first actuator means is contingent neither on the completion or near completion of said insertion of said worm nor on the existence of sufficient frictional forces between said worm and said cork to prevent said worm from unwinding from said cork.

4. Apparatus according to claim 1 wherein said axial motion of said second actuator means is controllable independently of said axial motion of said first actuator means to the extent that said second actuator means may be moved axially away from said bottle despite the movement of said first actuator means towards said bottle not necessarily having reached or nearly reached the limit of its freedom of movement.

5. Apparatus according to claim 1 further comprising means whereby a user may apply longitudinal forces in either direction to said second actuator means.

6. Apparatus according to claim 5 wherein said longitudinal forces are not transferred to said second actuator means via said worm.

7. Apparatus according to any of the preceding claims wherein a third actuator means is arranged to apply, in use, a first force to move said second actuator means away from said bottle;
   wherein, in use, after insertion of said worm into said cork, said cork is extracted by said first force, said first

force being applied to said worm by said second actuator means.

8. Apparatus according to any of the preceding claims wherein the worm is a helical worm.

9. Apparatus according to any of the preceding claims wherein said second actuator means comprises a control nut having a passage arranged to receive said worm.

10. Apparatus according to claim 9 wherein said passage is a hole.

11. Apparatus according to any of the preceding claims wherein said first actuator means is operatively connected to at least one first conversion means for converting rotational motion into longitudinal motion.

12. Apparatus according to Claim 11 wherein said first conversion means is for converting rotational motion about at least one axis in a first direction substantially perpendicular to the axis of said worm into longitudinal motion in the axial direction of said worm.

13. Apparatus according to Claim 11 or 12 wherein said first conversion means comprises at least one first rack and pinion system.

14. Apparatus according to Claim 11,12 or 13 wherein said first conversion means further comprises at least one pivotal arm through which in use applied rotational motion may be conveyed to said first conversion means.

15. Apparatus according to any of claims 11 to 14 wherein said first actuator means is mounted on a longitudinally movable part of said first conversion means.

16. Apparatus according to claim 15 wherein the worm is mounted such as to be rotatably movable about its axis.

17. Apparatus according to any of the preceding claims comprising a first conversion means which comprises means for converting forces applied by a user into longitudinal forces acting in the axial direction of said worm such that non-longitudinal forces substantially balance each other.

18. Apparatus according to any of the preceding claims wherein said second actuator means is operatively connected to at least one second conversion means for converting rotational motion into longitudinal motion.

19. Apparatus according to claim 18 wherein said second conversion means is for converting rotational motion about at least one axis in a second direction substantially perpendicular to the axis of said worm into longitudinal motion in the axial direction of said worm.

20. Apparatus according to claim 18 or 19 wherein said second conversion means comprises at least one second rack and pinion system.

21. Apparatus according to claim 18, 19 or 20 wherein said second conversion means further comprises at least one pivotal arm through which in use applied rotational motion may be conveyed to said second conversion means.

22. Apparatus according to any of claims 18 to 21 wherein said second actuator means is mounted on a longitudinally movable part of said second conversion means.

23. Apparatus according to any of the preceding claims comprising a second conversion means which comprises means for converting forces applied by a user into longitudinal forces acting in the axial direction of said worm such that non-longitudinal forces substantially balance each other.

24. Apparatus according to any of the preceding claims further comprising a first conversion means for converting rotational motion about a first direction into longitudinal motion and further comprising a second conversion means for converting rotational movement about an axis in a second direction into longitudinal motion.

25. Apparatus according to claim 24 wherein said first direction and said second direction are substantially perpendicular.

26. Apparatus according to claim 24 wherein said first direction and said second direction are substantially parallel.

27. Apparatus according to any of the preceding claims further comprising indicating means for indicating the axial position of said worm.

28. Apparatus according to claim 27 wherein said indicating means is operatively connected to said first actuator means.

29. Apparatus according to claim 27 or 28 wherein said indicating means is mounted on a longitudinally movable part of a first conversion means for conveying longitudinal motion to said first actuator means.

30. Apparatus for extracting a cork from a bottle substantially as hereinbefore described with reference to the appended drawings.

31. A method of extracting a cork from a bottle utilizing an apparatus comprising a first actuator means comprising a worm and a second actuator means arranged whereby relative movement between it and said worm causes rotation of said worm, said method comprising a first step of applying force to said worm such

as to cause said worm to rotate relative to said second actuator means and penetrate said cork, and a second step of applying force to said second actuator means such that said force moves said second actuator means away from said bottle, whereby said second step may be commenced by a user irrespective of the penetration distance of said worm into said cork during said first step, and whereby said force applied to said second actuator means is conveyed to said worm and said cork such that said cork may be extracted from said bottle.

32. A method of extracting a cork from a bottle substantially as hereinbefore described with reference to the appended drawings.

The Patent Office

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Claims searched: 1-32

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.N): B8T (TKC)

Int Cl (Ed.6): B67B 7/04

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage			Relevant to claims
X	GB2053867A	(ALLEN)	- see figures 6-11	1 &8-10
X	US5361652	(ANDINA)	- see figures 1,7 & 9	1&8-10
X	US0776152	(STROHACKER)	- see figures 5 & 6	1&8-10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.